

## Undergraduate research skills during the pandemic

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### Abstract

The objective of this study was to determine the research competencies of university students present during the Covid-19 pandemic. The basic research, with a quantitative, non-experimental-analytical comparative approach, of cross-sectional design, investigated the development of research competencies of students from different careers. The study population consisted of 302 students of the last cycles enrolled in the 2021-I semester. Of the respondents, 46.1% indicated that they have previous research experience; 66.7% use specialized platforms; 68.6% use the information available on the Internet; 56.9% recognize having difficulties in distinguishing refereed publications; 48.5% stated that they do not feel capable of presenting the results obtained.

**Keywords:** Investigative competencies, research, students, Covid-19.

### 1. Introduction

Faced with the uncertain outlook, due to the various effects caused by Covid-19 in different scenarios around the world, the rulers opted to provide preventive measures to mitigate the economic, social, and educational imbalance. This generated an abrupt change in the population. University education, considered one of the pillars of the growth of each nation, presented a radical change, whose measure contemplated migrating from traditional (face-to-face) education to a new digital scheme (Rosario et al., 2021; Zambrano and Chacón, 2021). Therefore, university faculty and students had to rethink their activities in the face of the new normality, which led to seeking alternatives for the achievement of learning and the development of scientific research, as well as the development of digital and research skills to contribute to university education (Zambrano and Chacón, 2021).

Unesco and the United Nations promote scientific research through the project called Open Science, and on the resilient progress of governments towards their inhabitants, which is considered as the new collaborative movement, to attract the innovative and scientific talent of each nation. Even more so at this stage of the pandemic, when students' research skills become a tool that strengthens scientific knowledge (Unesco, 2021; United Nations, 2021). In a Brazilian report, it is summarized that the pandemic crisis affected 42% of university students (Noguera, 2020). Considering that, in the city of Sao Paulo, there are the University of Campinas, the University of Sao Paulo, and the Estadual Paulista, which represent a total of 120 thousand university students, of which 40% of the students are engaged in scientific research (Leinden, 2021; Nexos, 2020). In the same context, in a Colombian study of the Javeriana University, delays were observed in the delivery of scientific production of both faculty and undergraduate

students; but at the same time, through the use of strategies, other aspects were strengthened that led to improving online collaboration, through the use of networks, multidisciplinary teleworking and the exploration of alternatives such as document centralization (Fog, 2020). On the other hand, the Colombian report on research competencies points out that the Colombian National Education Directorate, provided policies for the development and strengthening of research, to improve research competencies (Ayala and Barrera, 2018).

In the national context, the Peruvian report on Covid-19 in times of pandemic showed that students and researchers could react and respond to continue with research efforts (León, 2020). Through Presidential Resolution 045-2021-Concytec, it is confirmed that in Peru it is necessary to potentiate scientific production, to generate technological and scientific sovereignty that allows solving the country's problems, leaving dependence on other nations, rescuing, even more, the contribution that arises from university students as part of obtaining the academic degree, whose research capabilities fall on the virtual environment for the expansion of their knowledge (Concytec, 2021).

Under the present context, the study focused on professional careers such as Administration, International Business, Accounting and Auditing, Tourism and Hospitality, Industrial Engineering, and Systems Engineering, to show what are the competencies of university students to break the paradigms of traditional research through the new normality that lurks, but which, in turn, strengthens various aspects that lead to the realization of the scientific contribution such as the identification and organization of information, scientific generation of knowledge, dissemination of knowledge through the application of the scientific method. Finally, the objective of the study was established, which was framed in determining the research competencies of university students during the Covid-19 health crisis according to gender, age group, and professional career.

## Theoretical foundation

The study was developed under the positivist paradigm because it is objective and practical when it comes to explaining and controlling the phenomena of the study, which fall under the competencies of the research during the new normal of the pandemic crisis. The application of the positivist paradigm leads to the use of quality criteria and the use of statistics that refer to the steps of the scientific method. Therefore, the research competencies in this article possess objective and neutral qualities to relate to the positivist paradigm (Queiroz et al., 2017; Rebagliato, 2003).

In the same context, research competencies are based on systems theory and holistic theory, which are situated on competencies and the research process. That is, systems theory encompasses everything external with the internal in a holistic and related way, to work together among its scientific parts (Bertalanffy et al., 1987); therefore, research competencies gather a set of knowledge such as skills, values, and knowledge that make up the correct execution of the method. Therefore, it is related because university students, being immersed in the world of research, put into practice the use of diverse qualities and skills in an integral way, to solve problems or to deepen in the cause that affects a population.

Likewise, it is supported by the holistic theory that seeks to understand and explain the phenomena that arise from science as a whole. That is, to put into practice the whole and integral phenomena of study (Udina, 2021; Correa, 2009). The holistic theory is considered a complex knowledge, which seeks the understanding of a new knowledge, which has abstract characteristics that are not seen but are part of the analysis of a phenomenon. In other words, it is based on complex and abstract learning, whose function is to broaden knowledge (Mallari and Myrel, 2013; Gonzales, 2013).

The competencies contemplate a set of knowledge, applying the logical and integral thinking of the scientific method (Beneitone, et al., Reflections and perspectives of higher

education in Latin America), are part of the human qualities that are strengthened through the use of deep knowledge (American Physiological Society, 2019).

Research competencies consist of attitudes and technical skills (Muñoz et al., 2001; Orosco, 2021), necessary for the elaboration of technological and scientific material, which is carried out through a sequence of ordered steps and resources, aligned with the knowledge and knowledge of the scientific method (Zambrano & Chacón, 2021; Muñoz et al., 2001; Castrillon, 2012).

During the pandemic, the information search scenario depended on the Internet service, sources, and digital resources to achieve its mission. The characteristics of research competencies focus on the following points: (a) research method; (b) ethical values; (c) digital information search; (d) critical reading; (e) language skills; (f) socialization of results; (g) presentation at scientific events; and finally (h) the publication and writing of articles. In other words, it can be deduced that research competencies refer to a group of complex skills for the development of research that will mature over time (Henríquez, Gisert, & Fernández, 2018).

The levels of research competencies are a function of students' research maturity. Therefore, universities play an important role in promoting and generating new knowledge to achieve high levels of academic satisfaction, as study centers generate innovative training, which is reflected in the publications of students and professors. That is, the effort is materialized in the results of publications (Reiban, 2018).

As part of previous work at the international level, we have the contribution of Ayala and Barrera with the study to determine research competencies in university teachers, showing that there is a high research focus by teachers, which is strengthened through the use of training strategies on the scientific method. Regarding participation in research events, a low level of compliance was evidenced, leaving aside the exposure of research that enriches the entire research process (Ayala & Barrera, 2018).

In the study on research competencies in university students, the effort to expand their knowledge through reflection and attitude was evidenced, to change reality and provide solutions; as well as, to deepen and understand the problems that afflict organizations (Buendía, Zambrano, & Alirio, 2018). In the same scenario is the study on research competencies in senior students in the city of Barcelona, where there are medium-high levels of the perception applied to the process of the scientific method. The deficiencies lie in the writing, the use of the instruments for collecting bibliographic sources, in addition to the lack of citations with APA or ISO style. Therefore, the proposal for improvement is immersed in knowing and putting into practice, the phases of the scientific method (Rubio et al., 2018).

In the study on research competencies in medical university students in Brazilian universities, it was identified that, in later grades close to the completion of the professional career, they developed domains in considerable levels, associated with writing and bibliographic compilation of differences from other faculties (Andrade, et al., 2018). Regarding the approaches to competencies, it was evidenced that discipline is one of the most relevant factors, followed by reflection and self-criticism (Santo and Ramos, 2019). Likewise, quantitative research contributes to the professional development of students and generates a quality status, by establishing a collaborative role that contributes to research (Andrade, et al., 2018). It is reaffirmed that the fulfillment of this research cycle depends on the application of a critical, reflective, and participatory approach. That is, aligning under integrity and transversality to generate new knowledge, through the use of comprehensive and multidisciplinary skills when identifying bibliographic sources and performing the procedure of the scientific method.

In a study on the importance of the development of research skills by students and teachers, with the use of technological tools that strengthen and favor the development of their skills (Antúnez & Veytia, 2020). In the same context, we have the analysis approach in universities when training and motivating

research in health sciences students. Which consists of strengthening the research skills of students through summer programs and collaborative work, which promote such skills (Rodríguez, 2020; Suárez, Rincón, & Niño, 2020). Finally, in an exploratory study on the use of web 3.0 tools, they stated that educational institutions should leave aside traditional schemes and focus on improving teaching methods through the contribution of technological tools, to strengthen skills, research as a collection of bibliographic sources, Barros-Bastidas, Turpo (2020), (Espinoza et.al., 2016; Román, 2017; Balderas, 2017).

## 2. Method

The research is of basic type, developed according to the theoretical foundations of the quantitative approach, the design was non-experimental-analytical, comparative, and transversal, allowing for investigation of the development of the research competencies of the students of the professional careers of administration and engineering.

The study population consisted of 302 students of the IX and X cycle enrolled in the semester 2021-I, the sampling was accidental, being constituted by 204, distributed in each professional career, as shown in Table 1. The age of the students was between 18 and 58 years old, the mean was 27 and the standard deviation was 5.70. The distribution corresponded to 64.2% (131 students) between 18 and 28 years, 27.9% (57) between 29 and 38, 7.4% (15) between 39 and 48, and only 0.5% (1) between 48 and 58. The male sex accounted for 43.6% (89) and the female sex for 56.4% (115).

Table 1. Study population and sample

Careers	Population	Sample
Administration	83	60
International Business	44	17
Accounting and auditing	68	65

Tourism and hospitality	25	7
Industrial engineering	37	33
Systems engineer	45	22
Total	302	204

Source: Registration 2021 I.

The technique to collect data was the survey, the instrument used was the Ayala-García and Barrera-Prieto (2018) questionnaire, which consisted of three dimensions: a) D1 Identification and organization of information (12 items); b) D2 Scientific generation of knowledge (14 items); c) D3 Dissemination of knowledge (9 items) (Ayala & Barrera, 2018). The measurement scale was Likert: 1 Never, 2 Sometimes, 3 Always. Finally, the data were analyzed with descriptive and inferential statistics to test the hypotheses with SPSS 26 software.

## 3. Results

El 46,1% de los encuestados indicó que había realizado previamente un trabajo de investigación. Sin embargo, la tesis que están realizando en la actualidad, el 34,3% (70) corresponde al desarrollo de la carrera, el 27,9% (57) asumió el trabajo como requisito para optar a la licenciatura, y el 37,7% (77) para el título profesional.

Regarding the identification and organization of information, 62.7% (128) identify the sources of information for the development of the research. 53.4% resorted to and reviewed databases to search for articles and books that would allow them to construct the study. 66.7% use the specialized platforms available at the university, such as EBSCO. 68.6% use the information available on the Internet, but at the same time assume a critical and reflective attitude to include the contributions in the study. 56.9% admit that they have difficulty distinguishing between peer-reviewed and non-peer-reviewed publications. However, 54.9% avoid concatenating citations, analyzing them, and

constructing paragraphs with common information among authors. 48.5% state that they do not feel qualified to present the research work done.

Regarding the scientific generation of knowledge, only 44.1% identified in their environment the problems to be studied under the scientific method. 68.1% recognize that the study should contribute to the scientific knowledge of administrative sciences and engineering respectively. 42.6% adequately formulate research questions and hypotheses. 44.1% have difficulties in substantiating the authors' contributions and constructing a solid argument. 55.4% are unable to propose the methodological design of a research problem. 54.9% have difficulties in determining the population and sample of the study. 43.1% do not relate the design with the techniques and instruments for data collection. 46.6% are not familiar with the application of statistical tests for data analysis. 39.7% lack technological competence for the elaboration of tables, figures, indexes, and document configuration in Ms Word. 48% stated that they had difficulties in contrasting the results of the study with the background. Only 39.2% are aware of the ethical elements applicable to studies.

Concerning the dissemination of knowledge, 32.8% are aware of and are awaiting congresses, forums, journals, and spaces for the dissemination of research. 52.9% are unaware of the adequacy of the studies to the format established by an institution or category (presentation, book, article). 25.5% have never participated in a scientific event, while 45.9% sometimes participate. Only 41.7% recognize the importance of standardized norms for publications. 43.1% state that they can structure and write a scientific research report. 28.4% participate in knowledge-building networks. 27% have never participated in collaborative projects during their university life. Finally, only 29.4% adequately select the means for the dissemination of results.

The hypotheses put forward in the study correspond: Research competencies of university students during the pandemic are

statistically different according to gender, age group, and professional career.

The research competencies of university students during the pandemic are not statistically different according to gender ( $U = 4747.00$ ,  $p = .375$ ) and professional career ( $\chi^2 = 8.920$ ,  $p = .112$ ), as opposed to when analyzed by age groups. The age groups showed significant differences ( $\chi^2 = 9.943$ ,  $p = .019$ ), because, with greater age and professional experience, they relate and apply theory with experience in the development of research, in addition to presenting viable and feasible solution proposals to the problems identified.

#### 4. Discussion

Based on the collection instrument applied to university students during the health crisis, the fulfillment of the objective was evidenced, by determining that the research competencies of university students during the Covid-19 health crisis are not significantly different according to gender ( $p = 0.375$  and  $U = 4747$ ) and professional career ( $p = 0.112$  and  $U = 8.920$ ); This shows that both men and women from different professional careers present a high commitment, which favors the development of their skills and attitudes as part of the research competencies. Consequently, these results considerably favor research praxis, where students without implication or reason of gender and study are committed to participating in future research practices.

In the same scenario, it was evidenced that university students of the age group, present a considerable difference in research competencies ( $\chi^2 = 9.943$ ,  $p = .019$ ). That is to say, it is statistically demonstrated that students with more professional experience concerning their age, develop research competencies based on the 3 dimensions such as identification and organization of information, scientific generation of knowledge, and its dissemination.

In the same sense, it is shown that approximately 62.7% of the university students during the pandemic developed practically the use of the identification and search for information, which

allows them to adequately develop their research. Likewise, 68.6% use internet sources, 53.4% apply the use of the database for searching scientific articles, and 66.7% use university platforms as bibliographic sources. These results show that, during the pandemic, university students did not waste the momentum to carry out the development of their research. The attitudes and skills employed by university students assumed a leading, reflective and responsible role, to reach diverse sources of information that enriched the contributions of their research. It was also confirmed that there are 56.9% of university students suffer when differentiating between refereed and non-refereed publications, and 48.5% do not feel capable of supporting their research work. All this shows that it is necessary to reinforce the accompaniment of students during the development of their research to express confidence and answer doubts, as work before the support and development of studies.

On the other hand, there is approximately 56% of university students lack to associate the problems of the research work with the procedures of the scientific method. That is to say, there are problems for the students when approaching the approach and formulation of the problem, elaborating the hypotheses (56.4%), and defining the study methodology (44.6%) during the pandemic. Likewise, there are 68.1% recognize the importance of research contributions to the scientific community. In general terms, only approximately 39.2% of university students know and apply the use of ethical elements of research in the development of their study. For this, training strategies and development of research workshops should be proposed through the use of seminars that mitigate the deficiencies found, to understand and apply each procedure of the scientific method correctly and ethically. Finally, it was evidenced that 67.2% of university students do not participate in congresses, forums, magazines, and scientific dissemination spaces, which allow them to broaden their knowledge for the development of their studies. All this is manifested in the fact that 25.5% have never participated in research events, while 45.5% have only participated a few times. Specifically,

it should be noted that 43.2% of the students do have the ability to structure and write a research paper. In general terms, in the case of 30% of university students during the pandemic, they correctly select the journal or congress for the publication of their study.

## 5. Conclusions

The results of this work showed that, despite the pandemic, students took advantage of learning opportunities to improve their research skills, assuming reflective and disciplined roles. It is worth highlighting the importance of improving the skills of the teachers called to accompany them in this process, answering questions, and guiding the processes of defense and development of the research topics. It is recommended to generate a study that allows knowing the skills of teachers to develop research and to develop these skills in students. It can be concluded then that there is a general interest on the part of students to develop themselves in the area of research, but that in some cases there are barriers that are related to their experience and age, more than to their gender. University professors are called upon to promote these skills based on their own experiences, so it is the task of university institutions to enable the development of these skills through constant training.

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